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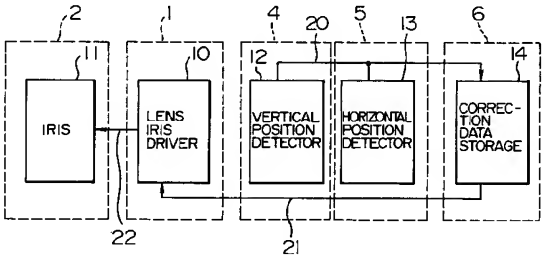
(54) Surveillance camera with automatic exposure control.

(57) An object of the present invention is to control the lens iris and shutter speed such that automatic light quantity adjustment is made of an object the image of which is to be picked up without being influenced by the ambient quantity of light. Another object of the present invention is to control the shutter speed of an image pickup camera to pick up the image of a target object during the rotation of a rotational stand without allowing the image to flow asynchronously. An image pickup camera 1 comprises a vertical position detector 12 and a horizontal position detector 13 for detecting the rotational position of the camera 1. Data 21 on control over the quantity of light for the detected positional information 20 is beforehand stored in a correction data storage 14. Correction data 21 for the position information 20 is delivered to the camera 1. A lens iris driver 10 subtracts the correction data 21 from the quantity of light from a lens 2 to produce a signal to automatically control the light quantity of the lens iris 11.

FIG. 2



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BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention relates to television camera devices installed at automatic cash payment devices in counters of stores and banks.

DESCRIPTION OF THE PRIOR ART

Conventionally, when a television camera of this type is installed at an automatic cash payment device in a bank or the like so that its single image pickup camera monitors a wide range at a time, the image pickup camera is mounted on a rotational stand, which is rotated at predetermined intervals of time.

At this time, since the brightness of an object the image of which is to be picked up fluctuates due to rotation of the camera, it is necessary to cause the iris of the lens or the shutter speed to change in accordance with a change in a quantity of light from the object. To this end, the indoor quantity of light is devised so as to be as uniform as possible or a lens is used which has the function of automatically adjusting the quantity of light to thereby cause the iris of the lens to automatically follow a possible change in the quantity of light of the object.

In the conventional television camera device the quantity of light of the overall object is automatically adjusted and the iris of the lens is adjusted to the quantity of light. However, if the object simultaneously includes a window through which external light is received and a person to be monitored, the iris of the lens must be adjusted to the person to be monitored (hereinafter referred to as a moving object). However, this adjustment is influenced by an object such as a landscape which can be viewed through the window other than a person (hereinafter referred to as a fixed object). If the iris of the lens is adjusted to such object with reference to automatic light quantity adjustment, the iris would be adjusted to the window through which external light is received. Thus, an image of the face of a person who is moving object would darkly be picked up, undesirably.

Also, when the light sensitive time of the image pickup camera is changed in accordance with a change in the shutter speed of the camera under the above image pickup conditions to thereby make light quantity adjustment, the shutter speed would be adjusted to the window through which the external light is received and the image of the face of the person who is a moving object would darkly be picked up, undesirably.

During the operation of the stand, the video signal would asynchronously flow and the object cannot clearly be determined, undesirably.

SUMMARY OF THE INVENTION

The present invention solves such conventional problems. It is an object of the present invention to provide an excellent television camera device which detects a position where the image pickup camera picks up the image of an object, sets a lens iris or a shutter speed in consideration of a quantity of light of a fixed object and realizes optimal image pickup of the object to be monitored.

It is another object of the present invention to provide an excellent television camera which detects the rotational speed of an image pickup camera, operates an electronic shutter at an appropriate speed relative to the rotational speed of the camera to thereby realize image pickup which does flow asynchronously also during the rotation of the camera.

In order to achieve the above objects, according to the present invention, an image pickup camera with automatic light quantity adjustment is placed on a rotational stand which can rotate horizontally and vertically. Means are provided for detecting the rotational position of the stand. A storage for storing data on control of the lens iris for data on the rotational position of the camera obtained by the detecting means is provided to thereby feed data on the control of the lens iris for the rotational position of the stand to automatic adjustment of light quantity to control the lens iris.

An image pickup camera with automatic light quantity adjustment is placed on a rotational stand which is able to rotate horizontally and vertically. Means are provided for detecting the rotational position of the rotational stand. Means are provided for storing data on control over a lens iris for the data on the rotational position of the camera obtained by the detecting means whereby the control data on the lens iris for the rotational position of the camera is delivered to the automatic light quantity adjustment to thereby control the iris.

An image pickup camera with a variable shutter function is placed on a rotational stand which is able to rotate horizontally and vertically. Means are provided for detecting the rotational position of the rotational stand. Means are provided for storing data on control over a lens iris for the data on the rotational position of the camera obtained by the detecting means whereby the control data on a shutter speed for the rotational position of the camera is delivered to the camera to thereby control the shutter.

An image pickup camera with a variable shutter function is placed on a rotational stand which is able to rotate horizontally and vertically. Means are

provided for detecting the rotational speed of the rotational stand. Means are provided for storing data on control over a shutter speed for the data on the rotational speed of the camera obtained by the detecting means whereby the control data on a shutter speed for the rotational speed of the camera is delivered to the camera to thereby control the shutter.

Therefore, according to the present invention, data on control over the rotational position of the camera is fetched from the storage, so that control of the automatic light quantity adjustment with this data advantageously provides the adjustment of the lens iris and shutter speed to a moving object to be monitored without following a fixed object.

Since data on control over the rotational speed of the camera can be extracted from the storage, control over the shutter speed with this data prevents a video signal from flowing asynchronously during rotation and a deterioration in the sensitivity when the stand is at a stop.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a front view of a television camera device indicative of an embodiment of the present invention.

Fig. 2 is a block diagram of a television camera device indicative of a first embodiment of the present invention.

Fig. 3A shows a landscape of the vicinity of a glass covered inlet in a bank the image of which is to be picked up by the present device.

Fig. 3B shows a landscape of an automatic cash payment device the image of which is to be picked up by the present device.

Fig. 4 is a block diagram of a television camera device indicative of a second embodiment of the present invention.

Fig. 5 is a block diagram of a television camera device indicative of a third embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 is a front view of a television camera device indicative of an embodiment of the present invention. Fig. 2 is a block diagram of a television camera device as a first embodiment of the present invention.

In Fig. 1, reference numeral 1 denotes an image pickup camera with the function of automatically adjusting a quantity of light incident thereto. Reference numeral 2 denotes a lens which is able to change its iris in accordance with a control signal from the camera 1. Reference numeral 3 denotes a support stand on which the camera 1 is fixed; 4, a vertical rotational stand which rotates vertically through the support stand 3 which supports the camera 1; and 5, a horizontal rotational stand which rotates horizontally through the support stand 3 like the vertical stand 4. Reference numeral 6 denotes a storage which stores data on correction of the lens iris with a position to which the camera 1 has moved. The storage is fixed to the ceiling, for example, by bolts.

The lens iris control of the internal functions shown in Fig. 1 will be described with reference to Fig. 2.

In Figs. 1 and 2, the same reference numeral denotes the same device with the same characteristic. Thus, in Fig. 2, its further description will be omitted. In Fig. 2, reference numeral 10 denotes a lens iris driver which makes automatic light quantity adjustment which controls the iris of the lens 2 in accordance with the quantity of light of an input image and is built in the cameral 1. Reference numeral 11 denotes an iris which is built in the lens 2. Reference numeral 12 denotes a vertical position detector which has data on the vertical rotation position of the camera 1 and is built in the vertical rotation stand 4. Reference numeral 13 denotes a horizontal position detector which has data on the horizontal rotation of the cameral 1 and is built in horizontal rotational stand 5. Reference numeral 14 denotes a storage for correction data which stores data on correction of the lens iris for data on the position of the camera 1 obtained by the vertical horizontal position detectors 12 and 13.

The operation of the device will be described below.

In Fig. 2, the position to which the camera 1 has moved is obtained as position data 20 by the vertical position detector 12 and the horizontal position detector 13 and is fed to correction data storage 14. The position data 20 becomes a vertical and a horizontal position addresses in storage 14, which stores correction data on the lens iris in correspondence to these addresses, and this correction data is delivered as correction data 21 to the lens iris driver 10. When the driver 10 receives no correction data, it makes automatic light quantity adjustment using only a quantity of light from the object. When it receives correction data 21, it subtracts a correction value from the quantity of light from the object and makes automatic light quantity adjustment on the basis of the result.

When this device is used on a floor, for example, of a bank on which an automatic cash payment device is installed to pick up the image of the vicinity of an inlet door covered with glass such as that shown in Fig. 3A, very bright external light enters into the bank through its inlet, so that a person who enters into the bank through the inlet is irradiated with only indoor illumination. Therefore,

the image of such object is picked up using only automatic light quantity adjustment, the lens iris is adjusted under the influence of a fixed object which is exposed to the external light, so that the face of the person would be dark and clear image pickup cannot be performed. The inventive device provides correction data to such position data to provide automatic light quantity adjustment so as to pick up the image of the person's face in a bright state. In this case, the lens iris is set to a half iris value (+0.5), by which the iris driver 10 subtracts correction data (+0.5) from the light quantity from the object, so that the actual light quantity is reduced compared to a seeming one to thereby open the iris 11 for image pickup.

When the image of a person who uses an automatic cash payment device coated with a relatively dark color such as shown in Fig. 3B is picked up using only automatic light quantity adjustment, the lens iris would be opened under the influence of the color of the payment device housing, so that the image of the person would be picked up as a whitish one and cannot clearly be picked up. The present device provides correction data to data on the position of the camera as a fixed object so as to be able to pick up the image of the person even if automatic light quantity adjustment is made. In this case, the iris value is set to a half closed value (-0.5). By this setting, the lens driver 10 subtracts correction data (-0.5) from the light quantity of the object, so that the actual light quantity is increased compared to a seeming one to thereby reduce the iris 11 for image pickup.

As just described above, according to the above embodiment, information on the position of the camera 1 can be detected by the vertical and horizontal position detectors 12 and 13, so that if correction data for the fixed object is added to the data on the position, automatic light quantity adjustment which is not influenced by the fixed objects is made even if the quantity of light is fluctuated by the rotational stand. Therefore, the image of an object such as a person to be monitored can clearly be picked up, advantageously.

By adding a clock function to the correction data storage 14 to determine whether it is now in the daytime or at night, correction data may be added or not. In this case, different lens iris correction is provided depending on whether it is now in the daytime or at night.

In the automatic light quantity adjustment by the lens iris driver 10 of the above embodiment, the contour of an image by which the light quantity is observed may be either only the center of the picture or a lower half of the picture in place of the overall object. Alternately, the picture may be divided into fine segments with corresponding coefficients and the sum of the product of the respective light quantities of the segments and the corresponding coefficients may be the overall quantity of light, in which case better automatic light quantity adjustment is provided to thereby clarify an object to be monitored without being influenced by the ambient objects, advantageously.

A second embodiment will be described next.

Fig. 4 is a block diagram of the second embodiment of the present invention.

In Figs. 4, 1 and 2, the same reference numeral denotes the same device with the same characteristic and its further description will be omitted. In Fig. 4, reference numeral 23 denotes a CCD device with a shutter to control the light sensitive time on the basis of the light quantity of an input image. Reference numeral 24 denotes a shutter pulse generator which controls the speed of the shutter pulse of the CCD device 23 and built in an image pickup camera 25 with a variable shutter. Reference numeral 11 denotes an iris built in the lens 2. Reference numeral 12 denotes a vertical position detector which has information on the vertical rotational position of the camera 1 and is built in the vertical rotational stand 4. Reference numeral 13 denotes a horizontal position detector which has information on the horizontal rotation of the camera 25 and is built in the horizontal rotational stand 5. Reference numeral 14 denotes a correction data storage which stores data on correction of the shutter speed for the information on the position of the camera 25 obtained from the vertical and horizontal position detectors 12 and 13.

The operation of the camera of the second embodiment will be described next.

In Fig. 4, the position to which the camera 25 has moved is obtained as position data 20 from the vertical and horizontal position detectors 12 and 13 and delivered to correction data storage 14. The position data 20 becomes vertical and horizontal position addresses in the correction data storage. The correction data storage 14 stores correction data for the shutter speed at these addresses and the correction data is delivered as shutter speed correction data 29 to the shutter pulse generator 24. When no correction data is delivered to the generator 24, the lens iris 11 is normally open. The shutter pulse generator 24 controls the light sensitive time of the CCD device 23 to perform automatic light quantity adjustment using only the quantity light from the object. When the iris correction data 21 is delivered to the generator 24, the correction value is subtracted from the quantity of light of the object and automatic light adjustment is made on the basis of the resulting value.

When the present device is used on a floor of a bank on which a automatic cash payment devices are installed to thereby pick up the image of an inlet covered with glass and its vicinity, as

shown in Fig. 3A, very bright external light enters into the bank through the inlet and a person who enters into the bank through its inlet is irradiated with only indoor illumination. Therefore, if the image of such object is picked up using only automatic light quantity adjustment, the shutter is influenced by the fixed objects exposed to external light and the face of the person would be dark and clear image pickup cannot be performed. Even if correction data is added to the position data to thereby make automatic light quantity adjustment, control is provided such that the image of the person's face can brightly be picked up. In this case, the shutter speed is adjusted so as to be delayed by 1/1000 (sec). By such setting, the correction data of 1/1000 (sec) is subtracted from the light quantity of the object in the shutter pulse generator 24, so that the actual quantity of light is reduced compared to a seeming one and the CCD device with the shutter can brightly pick up the image of the target person.

When the image of a person who uses an automatic cash payment device coated with a relatively dark color shown in Fig. 3B is picked up using only automatic light quantity adjustment, the shutter is influenced by the color of the payment device housing, so that the image of the person would be picked up as a whitish one and cannot clearly be picked up. Even if correction data is added to the data on the position of the camera 1 which is such fixed object to thereby make automatic light quantity adjustment, control is provided such that the image of the person is brightly picked up. In this case, the shutter speed is adjusted so as to be increased by 1/1000 (sec). By such setting, the correction data of 1/1000 (sec) is subtracted from the light quantity of the object in the shutter pulse generator 24, so that the actual quantity of light is increased compared to the seeming one and the CCD device with the shutter can clearly pick up the image of a darkened target person.

As just described above, according to the present embodiment, the information on the position of the camera 1 can be detected by the vertical and horizontal position detectors 12 and 13, so that if correction data for fixed objects is added to the position information on the camera, automatic light quantity adjustment is made without being influenced by the fixed objects even if the light quantity fluctuates due to the rotation of the rotational stand. Therefore, the image of an object to be monitored such as a person can clearly be picked up, advantageously.

Fig. 5 is a block diagram of a third embodiment of the present invention.

In Figs. 5, 1, 2 and 4, the same reference numeral denotes the same device with the same characteristic and its further description will be omitted. In Fig. 5, reference numeral 23 denotes a CCD device with a shutter to control the light sensitive time on the basis of the light quantity of an input image. Reference numeral 24 denotes a shutter pulse generator which controls the speed of the shutter pulse of the CCD device 23 and is built in an image pickup camera 25 with a variable shutter. Reference numeral 27 denotes a vertical speed detector which has information on the vertical rotational speed of the camera 1 and is built in the vertical rotational stand 4. Reference numeral 26 denotes a horizontal speed detector which has information on the horizontal rotation speed of the camera 25 and is built in the horizontal rotational stand 5. Reference numeral 30 denotes a shutter speed data storage which stores data on the shutter speed for the information on the speed of the camera 25 obtained from the vertical and horizontal speed detectors 27 and 26.

The operation of the camera of the third embodiment will be described next.

In Fig. 5, the moving speed of the camera 25 is obtained as speed data 20 from the vertical and horizontal speed detectors 27 and 26 and is delivered to the shutter speed data storage 30. The speed data 28 becomes vertical and horizontal rotational speed addresses in the shutter speed data storage 30 which stores shutter speed data at these addresses and the data is delivered as shutter speed data 29 to the shutter pulse generator 24. This data controls the light sensitive time interval of the CCD 23 and hence the shutter speed.

This device has the advantage that the image signal thus obtained is recorded in a VTR and is reproduced in slow motion or frame feeding to thereby clearly ascertain the image without causing the same to be flowed asynchronously during the rotation.

As will be clear from the description of the above embodiment, the present invention can fetch from the storage data on control over automatic light quantity adjustment corresponding to the moving position of the camera. Thus, automatic light quantity adjustment is made with such data to thereby follow a moving object to be monitored without causing the lens iris and shutter speed to follow fixed objects, so that the image of a moving object is clearly picked up, advantageously.

Since data on the shutter speed corresponding to the rotational speed of the camera can be fetched out of the storage to control the shutter with this data, appropriate shutter control corresponding to the rotational speed is provided over the camera to thereby clearly pick up the image of the rotational object, advantageously.

Claims

1. A television camera device comprising:
an image pickup camera (1) having the function of adjusting a lens iris automatically in accordance with an external control signal;
means (4, 5) for rotating said camera freely;
means (12, 13) for detecting the position of said camera (1) rotated by said rotating means (4, 5); and
means (6) for storing data on a shutter speed corresponding to the position of said detecting means (12, 13), data on the position of said detecting means (12, 13) being output from said data storing means (6) as a control signal to said camera (1).

2. A television camera device comprising:
an image pickup camera (1) having the function of adjusting a shutter speed automatically in accordance with an external control signal;
means (4, 5) for rotating said camera freely;
means (12, 13) for detecting the position of said camera (1) rotated by said rotating means (4, 5); and
means (6) for storing data on the shutter speed corresponding to the position of said detecting means (12, 13), data on the position of said detecting means (12, 13) being output from said data storing means (6) as a control signal to said camera (1).

3. A television camera device comprising:
an image pickup camera (1) having the function of adjusting a shutter speed automatically in accordance with an external control signal;
means (4, 5) for rotating said camera freely;
means (12, 13) for detecting the speed of said camera (1) rotated by said rotating means (4, 5); and
means (6) for storing data on the shutter speed corresponding to the speed of said camera (1) detected by said detecting means (12, 13), data on the speed of said camera (1) detected by said detecting means (12, 13) being output from said data storing means (6) as a control signal to said camera (1).

FIG. 1

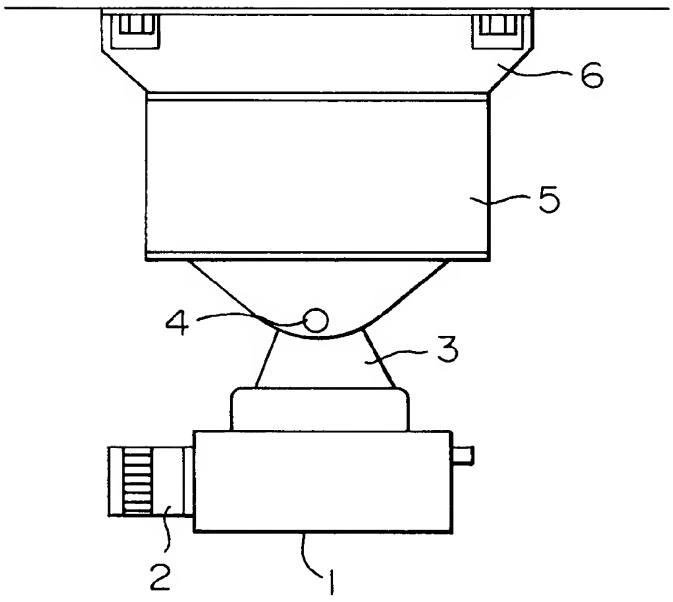

6
5
4
3
2
1

FIG. 2

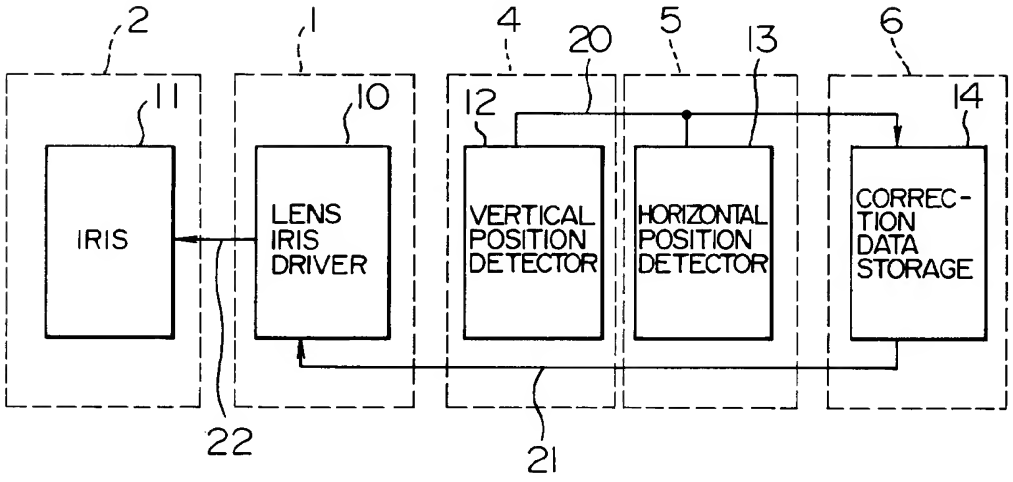

2
1
4
20
5
13
6
11
10
12
14
IRIS
LENS IRIS DRIVER
VERTICAL POSITION DETECTOR
HORIZONTAL POSITION DETECTOR
CORREC-TION DATA STORAGE
22
21

FIG. 3A

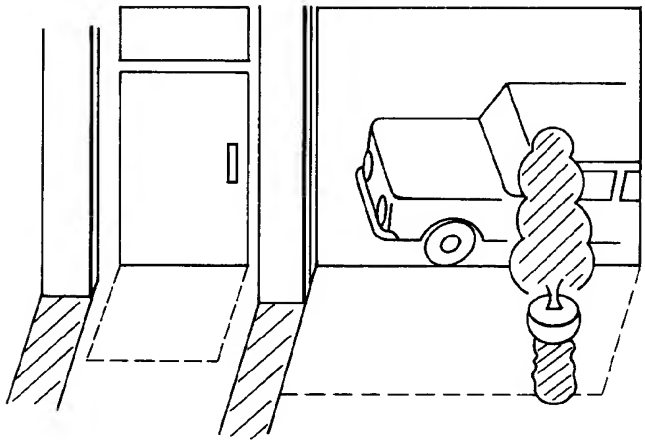


FIG. 3B

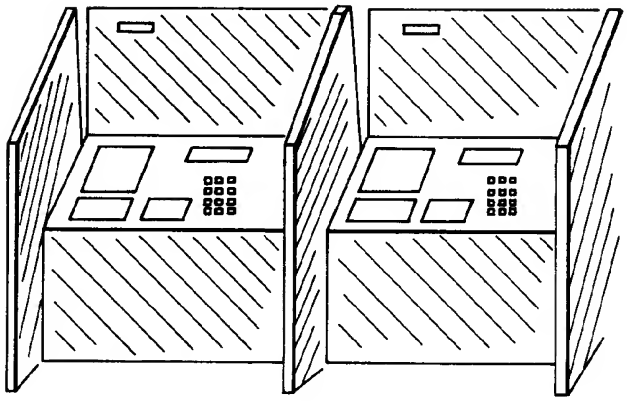


FIG. 4

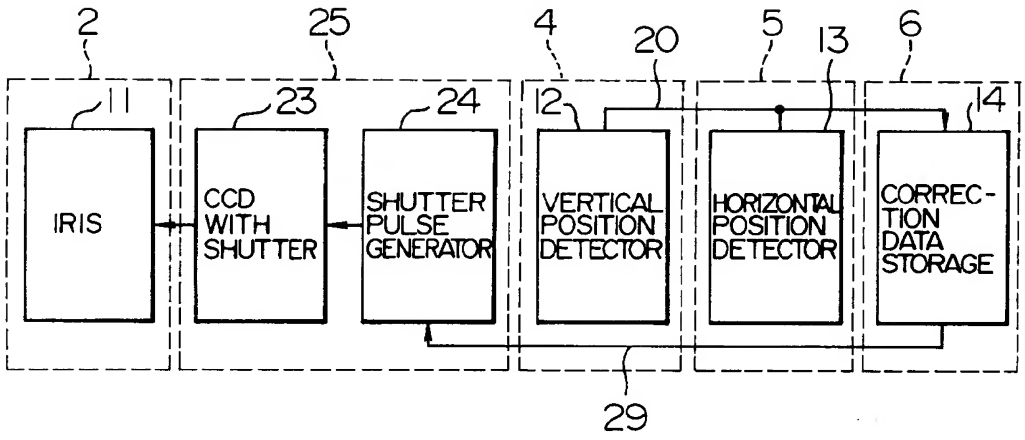
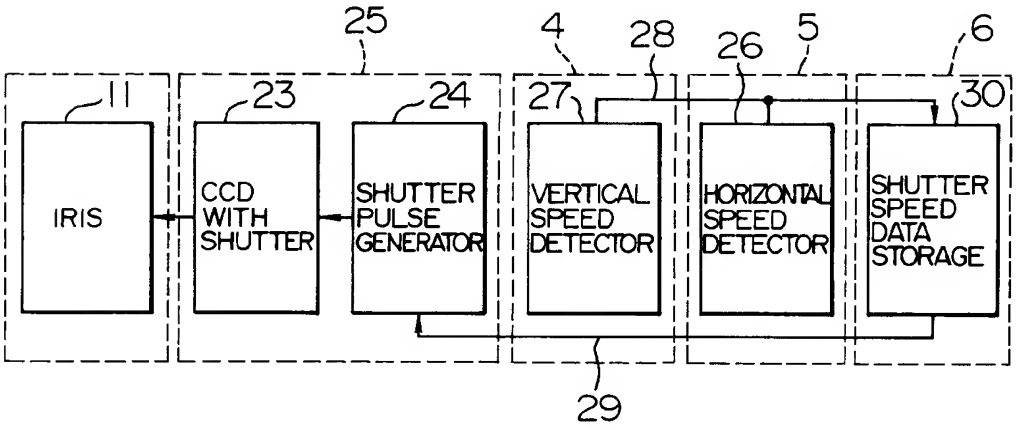

2
25
4
20
5
13
6
11
23
24
12
14
IRIS
CCD WITH SHUTTER
SHUTTER PULSE GENERATOR
VERTICAL POSITION DETECTOR
HORIZONTAL POSITION DETECTOR
CORREC-TION DATA STORAGE
29

FIG. 5


25
4
28
26
5
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11
23
24
27
30
IRIS
CCD WITH SHUTTER
SHUTTER PULSE GENERATOR
VERTICAL SPEED DETECTOR
HORIZONTAL SPEED DETECTOR
SHUTTER SPEED DATA STORAGE
29